Due: Wednesday Sept 13

HMC Math 142 Fall 2017

Prof. Gu

Problem Set 2

Start this assignment before Sunday night!

Read:

- Baby Do Carmo, Differential Geometry of Curves and Surfaces: Sections 1-3, 1-4, 1-5 and 1-6 of Chapter 1
- Handout 2
- Lecture Notes

Do:

A: Problems on Reviewing Cross Products in R^3.

- a) Problem 2 on page 14, Section 1-4, Baby Do Carmo.
- b) Problem 5 on page 14, Section 1-4, Baby Do Carmo.
- c) Problem 11 on page 15, Section 1-4, Baby Do Carmo.
- d) Problem 13 on page 16, Section 1-4, Baby Do Carmo.

B: Problems from Lectures

- a) Find the length of the curve obtained by intersecting the sphere $x^2 + y^2 + z^2 = 4$ and the cylinder $(x-1)^2 + y^2 = 1$ in R^3.

C: Other Problems

- a) Problem 1 on page 5, Section 1-2, Baby Do Carmo.
- b) Problem 3 on page 5, Section 1-2, Baby Do Carmo.
- c) Problem 4 on page 5, Section 1-2, Baby Do Carmo.
- d) Problem 5 on page 5, Section 1-2, Baby Do Carmo.

D: Application

- Find your favorite big dataset (download from yahoo stock data). You may use some of the datasets which can be found under `https://www.aeaweb.org/articles?id=10.1257/aer.104.1.1`.
- Use Polynomial Fitting or Gaussian Process or Spline Method to fit the data to get curves.
- Use functional data analysis and techniques you learned about curves such as velocity, acceleration,length and curvature to find information from your big dataset.